Successful Methods

A Magazine of Construction Service

Published by SUCCESSFUL METHODS, Inc.

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141 Centre St., New York City, N. Y.

Vol. 7 — JUNE, 1925 — No. 6

Setting the Standard

HIGHWAY affairs in this country are being conducted on a very high plane. We are spending more than a billion dollars a year on highway construction and maintenance. This is being done with the most complete freedom from suspicion ever known in any line of great public endeavor.

Our knowledge of how to build and maintain roads also is advancing rapidly. In fact, it is more than keeping pace with the phenomenal rate of growth of highway traffic. There remain many problems to be solved. New conditions that are continually coming up also must be met. These are all in the hands of federal and state highway officials of proven ability, many of whom are working for a fraction of what they could earn in private business.

The present methods and organizations have been developed almost entirely since the existing Federal Aid Act became effective. The provisions of that act and the manner in which they have been administered unquestionably have set a very high standard for our highway affairs. The total annual federal appropriations for highway work, great as they are, have doubtless been saved by the better methods which the Federal Aid Act has required.

So long as the present situation obtains, highway work in this country will continue to go forward on sound lines. There is, however, a well-organized movement to discredit the principle of Federal Aid to the states for highway construction. It seems difficult to disclose the interests behind this movement. Thus far they have worked smoothly and cleverly under perfect cover. They have found no openings through which to attack the administration of the Federal Aid Act. Their only hope seems to be in an effort to prove that the principle of the act is wrong.

Those who are following the situation as yet see no cause for alarm. The interests directing the attack are, however, undoubtedly well financed. They certainly have serious selfish motives in trying to undermine a work which has proved its value. They are working most adroitly to accomplish their aims. They evidently have a lot of brains at their command, and their influence in highway places is not lacking. But their task of stopping Federal Aid is hopeless, unless those who are responsible for our highway progress fail to sense the force and the direction of the attack.

Present indications are that the attack will continue to be directed against the principle of Federal Aid. But the keen minds behind the attack will shift to any other front through which they think they might make progress. There will be no danger of their success, if all who are concerned in our highway progress will do their part. That part is to inform the public how the standards of every phase of our highway movement have been raised to their present levels by the efficient administration of a thoroughly sound Federal Aid Act.

Poor Bookkeeping

THE average construction man knows little about keeping books. In fact, most of us do not know a double-entry ledger from a journal. Most of us do know, however, how to keep time. All of us know when we are overdrawn at the bank, and when the interest on our notes must be paid. But when it comes right down to proper accounting, not one construction job in fifty keeps the records that it should.

In these days of stiff competition it is absolutely necessary to know costs. Lumping off the job does not get by any more. It really never did. Nowadays our worst curse is the outfit which guesses at its costs and shoots at a price. These are the people who make it hard for responsible concerns to get work at living prices.

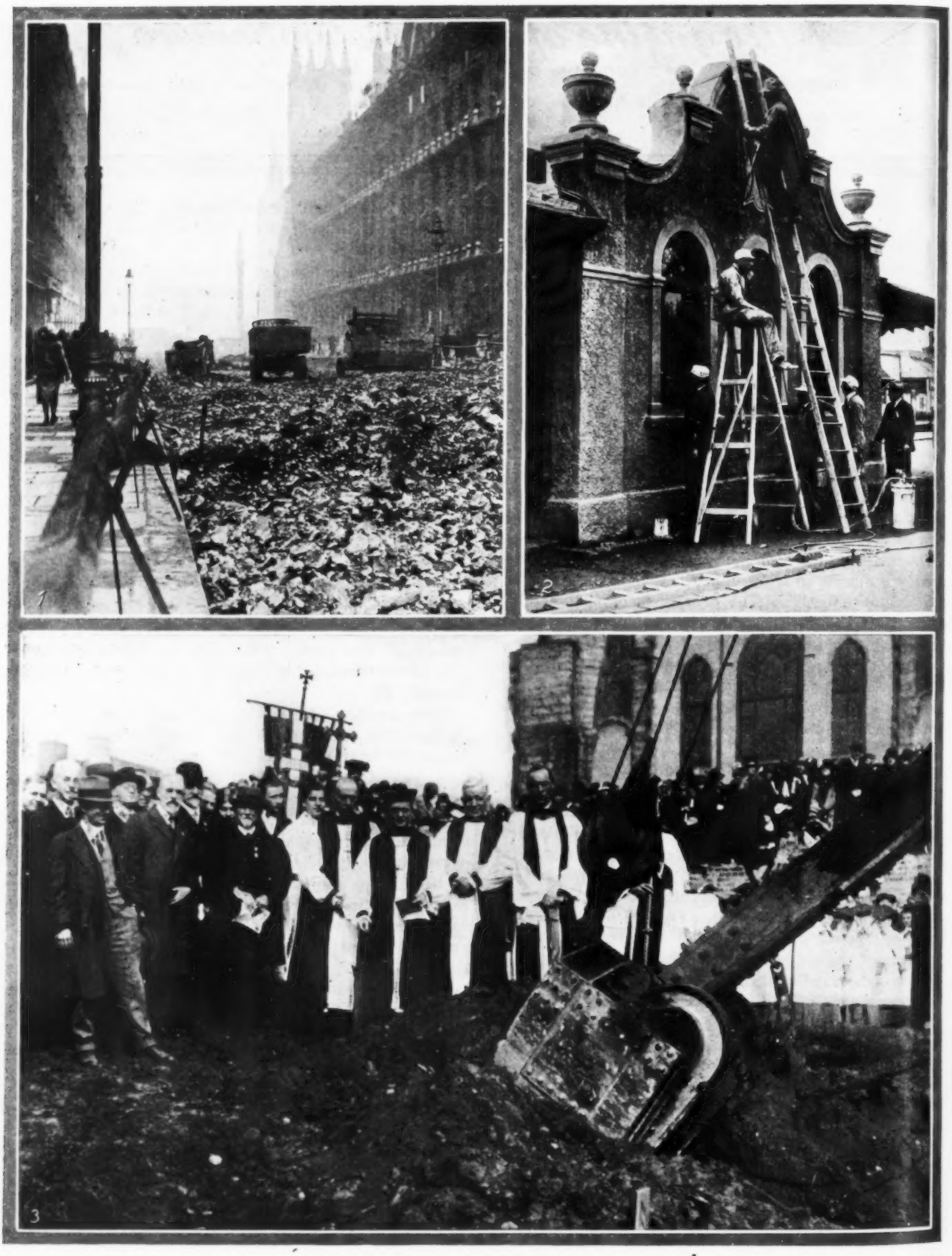
There seems to be no use in trying to get some men to face the facts which well-kept books bring out. Sooner or later they will fail, anyway. The men who do expect to make good must have accurate accounts on which to base their judgment.

Construction work is a complicated business. At the same time it is not difficult to set up books for field operations. Any good man who has had the right kind of banking or commercial house accounting experience can do the trick. He will probably include a lot of charges to which you will not be agreeable. For example, your personal automobile and your entertainment. He will, however, fix things so you can make sure whether you are getting ahead or slipping. Once set up, a set of books for a construction job are not hard to keep. They will be worth far more than their cost, in keeping before you how much you are spending for items that do not seem to amount to much.

This Magazine Is Free

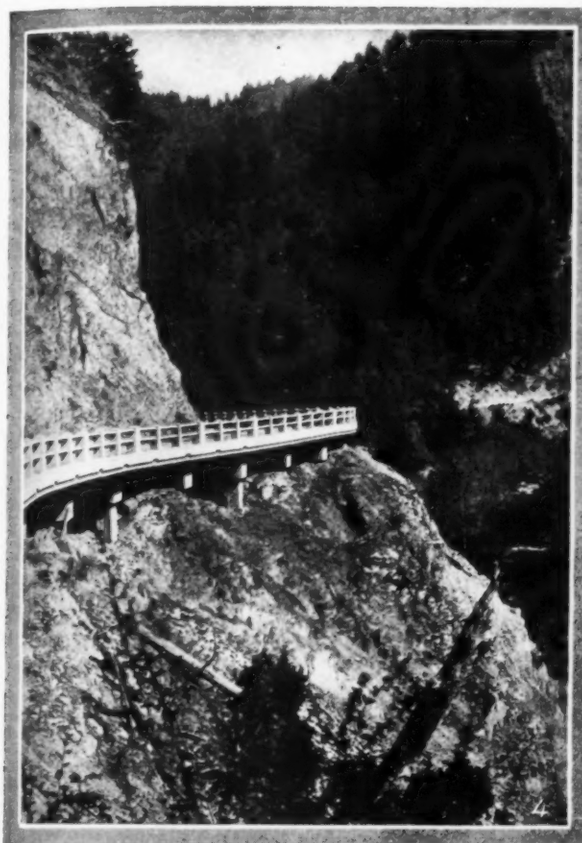
This magazine, which is issued monthly, is sent free of charge to 40,000 men engaged in various phases of construction work. If you are engaged in such work and do not receive the magazine, please send your name and address to SUCCESSFUL METHODS, 141 Centre Street, New York City. Be sure to state what work you do and with what company you are connected.

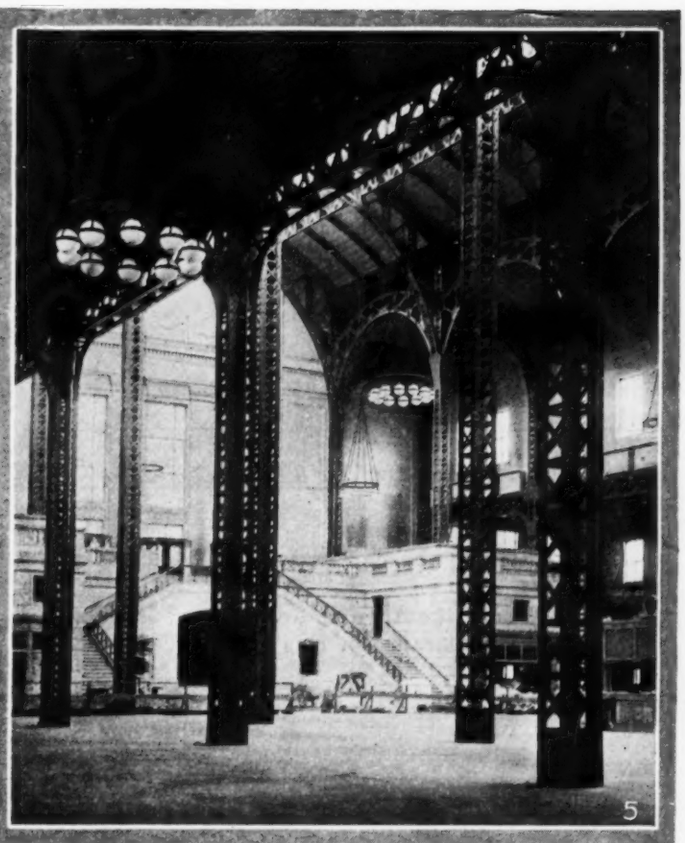
Construction Marks



1. The public christened Victoria Street, London, "No Man's Land," when it was torn up recently preparatory to repaving © *Keystone.*
2. The business men of Rockville Center, Long Island, repainted their railroad station recently when the railroad company refused to do it © *International.*
3. Bishop Manning of the Episcopal Diocese of New York (standing in center with book) presided over the ceremonies when a steam shovel began the excavation for the nave of the Cathedral of St. John the Divine © *P. & A. Photos.*

Path of Progress



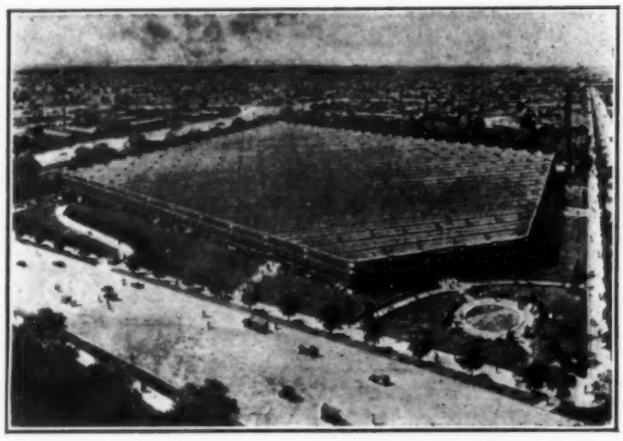


4. A California highway built on the shoulder of a cliff
5. The interior of the great new Union Station in Chicago © *P. & A. Photos.*
6. The splendid building recently constructed on the University of Wisconsin campus of Madison to house the Wisconsin General Hospital and to be a memorial to the soldiers killed in the World War. Unclaimed bonus money furnished the funds © *P. & A. Photos.*

LETTING IN THE LIGHT

Saw Tooth Design Requires Special Construction

A FACTORY building in which natural illumination has been utilized to the utmost has been constructed for the Atwater-Kent Manufacturing Company, makers of radio and ignition apparatus. This factory, which is at Wissahickon and Abbottsford Avenues, Philadelphia, was designed and constructed under the direction of the Ballinger Company of Philadelphia and New York, an organization which has given special attention to the development of buildings of this type.



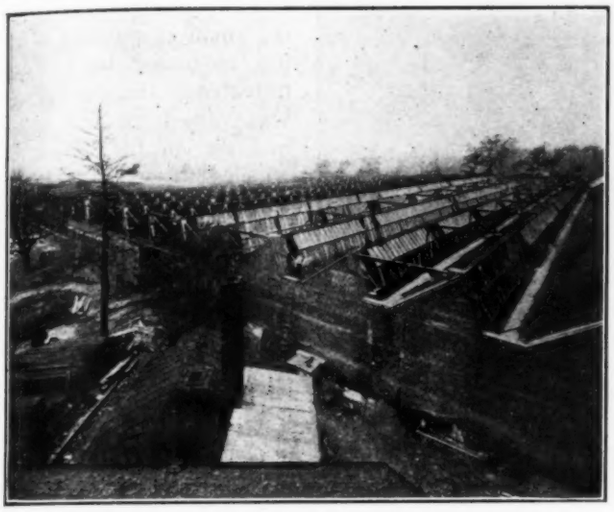
NOT A DARK SPOT IN THIS GREAT FACTORY

The vast area of the Atwater-Kent factory is shown in the small photograph on this page. The entire plant will occupy an area of 482,450 sq. ft., or about 11 acres. It has a frontage of 736 ft. on Wissahickon Avenue, 456 ft. on Abbottsford Avenue, 600 ft. on Deacon Street and 736 ft. on a private driveway. It was so planned that it could be constructed in three sections, the first being put up two years ago.

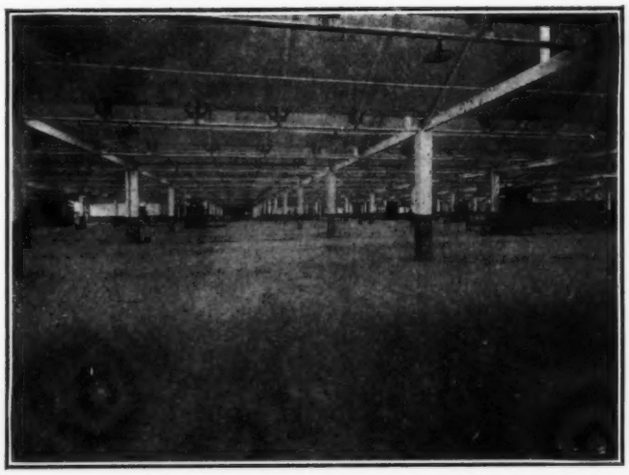
The photographs show various phases of the construction work and illustrate the method of putting up the super-span saw-tooth skylights. These saw-tooth skylights, instead of being parallel with the lot, have been designed at an angle of about 45 deg. with the side walls in order that they might face

PUTTING UP STEEL WORK ON ONE OF THE UNITS OF ATWATER KENT FACTORY

exactly north. The skylights in the saw-teeth have approximately one-third of the floor area and are sloped at such an angle that they prevent the direct rays of the sun from shining through and at the same time obtain the maximum of reflected light from the north and from the sloping roofs of the saw-teeth. The sashes in the upper half of the saw-teeth are made movable for ventilation and are so arranged that an entire row can be opened at one time from the floor.

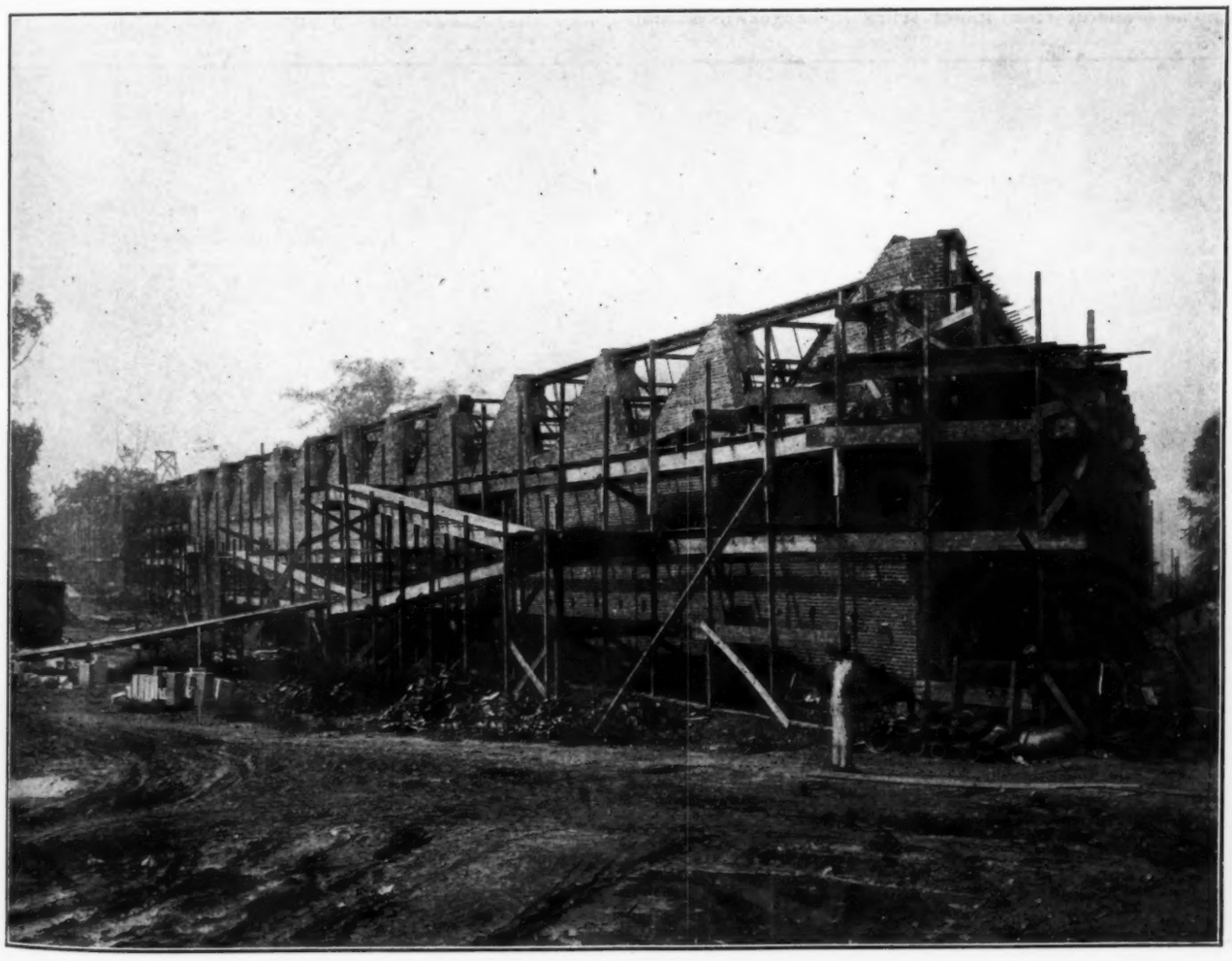


PLACING THE SASH



INTERIOR OF FACTORY SHOWING SMALL NUMBER OF COLUMNS

The small photograph at the right on this page shows how the super-span constructed has eliminated columns and also gives a good idea of the amount of daylight obtained. The large photograph at the bottom of this page shows the construction of one of the brick side walls with the steel work in place.



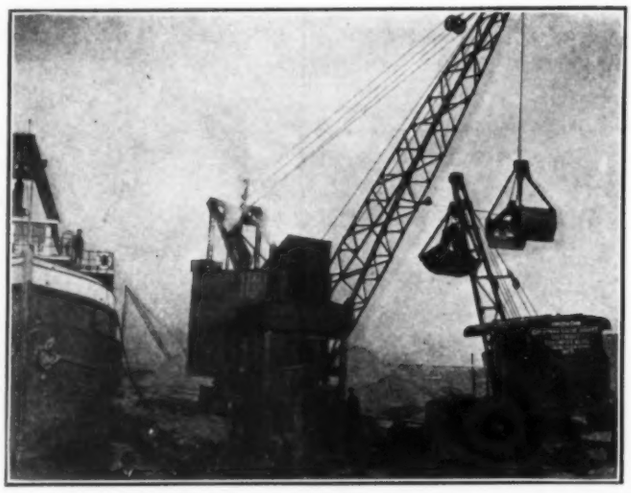
BRICK SIDE WALL OF ONE-STORY FACTORY

CRANE WORKS ON BARGE MOUNTING

Machine Is Taken Off Motor Truck to Do Some Dredging

THE Coffman Crane Service has done a number of unusual jobs since it has been in business, and recently tackled one proposition that was entirely different from any other project encountered. The Coffman Company maintains service cranes mounted on motor trucks, which are used throughout the city on various sorts of work in Detroit.

A call came recently from a contractor who had some slips for motor boats to dredge along the Detroit River. It was impossible to approach these slips in the land side because of the nature of the soil, so the crane was taken off its motor truck mounting and placed on a barge, which was then towed into position so that the crane could dredge the slips.



LOCOMOTIVE CRANE READY TO TRANSFER SMALL CRANE FROM TRUCK TO BARGE

The transfer from motor truck to barge was accomplished by a big locomotive crane on one of the docks. A chain was hitched from the bucket of the big crane to the A-frame clevis on the small crane, and after the mounting bolts were unfastened, the small crane was raised off the truck and set on the barge, to which it also was fastened down with U-bolts.

The job was done quickly and efficiently, and when it was finished the crane was lifted off the barge and returned to its motor truck mounting.

The big locomotive crane again handled the small outfit without mishap and it was the work of only a comparatively short time to refasten the mounting bolts and restore the crane to its original condition. The small crane then drove away and the next day was busy excavating in another part of the city.

CRANE MOUNTED ON BARGE DREDGING SLIPS FOR MOTORBOATS

DIGGING A SEWER IN LIMESTONE

Ohio Contractors Handle Difficult Work Efficiently with Steam Shovel and Gasoline Crane

HANDLING a job successfully which two other organizations have given up requires thoroughly efficient work. Haddad & Kairal, contractors of Lima, Ohio, have undertaken such a job in the construction of part of the sewer system of Lima. The contract is known as Contract B, which consists of the building of the intercepting and outfall sewer which follows the Ottawa River from the east to the west side of the town and includes three tunnels under railroads. Practically all of the earth that has to be excavated consists of filled ground upon a base of solid limestone rock and about 75 per cent of the trenches have to be cut through limestone rock from a depth of 6 in. to 10 ft. Much of the trench also is below water level which complicates the problem, and as the sewage disposal plant has not been built, there is no proper outlet for the water.

THE CRANE ON THE JOB

A steam shovel equipped with a 1-yd. dipper and a ¾-yd. gasoline operated crane is handling all of the excavation. The earth is first stripped with a shovel, the rock is blasted and then cleaned up with the crane. The trenches are tight sheeted and thus far more than 200,000 ft. of lumber have been placed. Since the job began 2 portable air compressors and 7 gasoline pumps have been kept busy.

STRIPPING EARTH WITH STEAM SHOVEL

GOV. FERGUSON DEDICATES HIGHWAY BRIDGE

Texas Executive Confines Her Speech to Twenty-Seven Words—New Structure Across Neches River Is Credit to State

By Joe B. Preston

GOV. MIRIAM A. FERGUSON of Texas identified herself with her State's highway program on May 9 when she officially opened the new bridge across the Neches River at Beaumont. The Governor set a splendid example for other public officials on like occasions by confining her speech to 27 words. Despite its brevity, the speech left no doubt in the minds of those who heard her of the fact that Governor Ferguson believes in good roads.

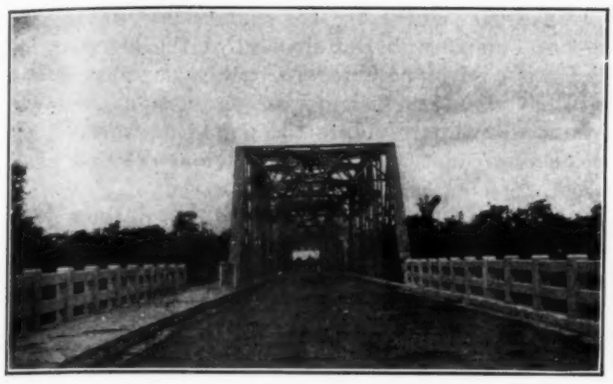
OUTRIDERS AND A BAND PRECEDED THE GOVERNOR

A crowd of about 10,000 persons was on hand to hear the Governor and to see her officially open the bridge. They cheered her upon her arrival and listened attentively to the few words which she had to say. Governor Ferguson began by stating that she was glad to have the honor of opening the bridge, but that it was too hot to make an extended speech. She then declared the bridge officially open and congratulated all those concerned in its construction. As shown in the photograph at the bottom of this page, Governor Ferguson was accompanied by her youngest daughter, Miss Dorrace Ferguson, and another daughter, Mrs. George Nalle.

THE SPEECHMAKING IN PROGRESS

THE GUBERNATORIAL PARTY AT THE MOMENT THE BRIDGE WAS OPENED. (FROM LEFT TO RIGHT) EUGENE SMITH, SECRETARY, TEXAS HIGHWAY COMMISSION; MAJOR W. E. LEA, PRESIDENT, TEXAS HIGHWAY ASSOCIATION; MISS DORRACE FERGUSON; GOVERNOR M. A. FERGUSON; MRS. GEORGE NALLE, THE GOVERNOR'S DAUGHTER; COL. GEORGE NALLE

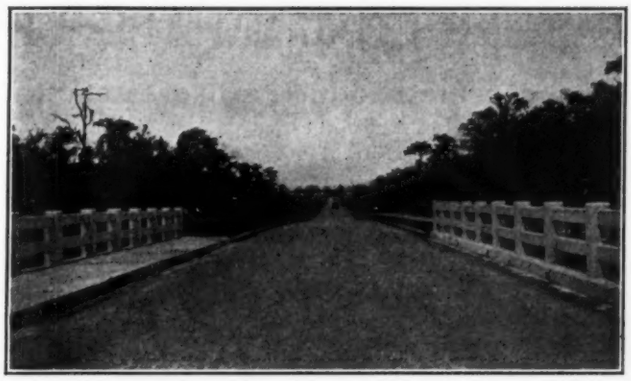
The new bridge crosses the Neches River about 35 miles from the Gulf of Mexico and replaces an old ferry at a point where the Old Spanish Trail, now known as State Highway No. 3, crosses the river. This is one of the principal east and west routes in that part of Texas. It is a route much used by transcontinental travelers. The new bridge cost $500,000 and consists of a steel swing span in the main channel 240 ft. in length and two truss spans each 125 ft. long supported by special design concrete piers.



LOOKING ACROSS THE NEW BRIDGE

The approach on the Jefferson County side consists of 2080 ft. of timber trestle and 175 ft. of reinforced concrete pile trestle. On the Orange County side the approach includes 175 ft. of reinforced concrete pile trestle and 500 ft. of heavy earth embankment. The roadway is 20 ft. in width and there is a 5-ft. sidewalk on the south side.

The pivot pier on which the swing span rests is 26 ft. in diameter and the other two piers consist of two shafts each 172 ft. in diameter. These piers were built by the cofferdam method, steel cylinders being sunk to a depth of 40 ft. below the surface of the water. The material in which the piers rest consists of about 5 ft. of sand and 8 ft. of clay. Under normal conditions the depth of the water at this point is about 24 ft.

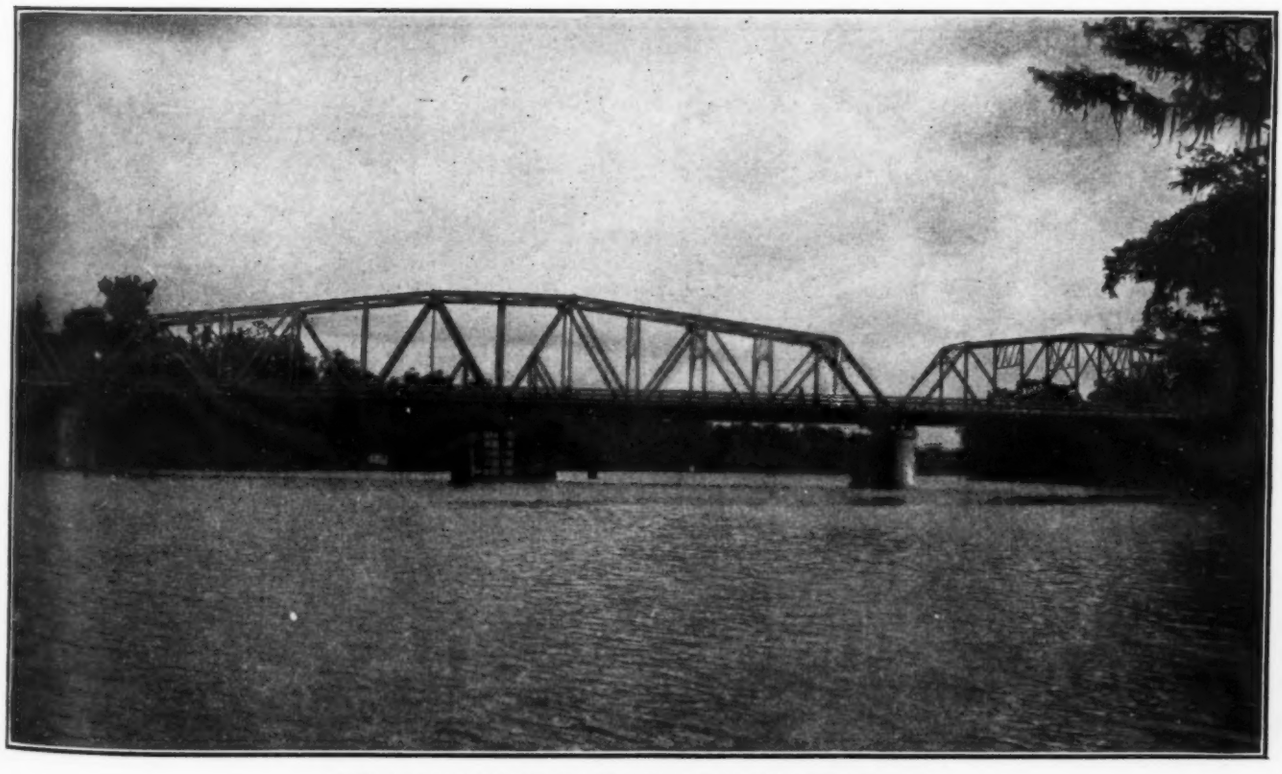


CONCRETE AND TIMBER TRESTLE ON JEFFERSON COUNTY SIDE

As the Neches River is navigable and ocean going vessels have to pass through the new bridge, the State Highway Department will have to keep a watchman and bridge tender on its payroll.

The photographs which accompany this article show the opening ceremonies when a special mounted guard and band preceded Governor Ferguson as her automobile crossed the new bridge. She made her speech in a specially constructed stand above which floated the flags of the United States and of Texas.

The other photographs show the newly finished bridge from various points of view.



THE NEW NECHES RIVER BRIDGE FROM THE SOUTH

CASTING CONCRETE PIPE FOR BUFFALO'S BOULEVARDS

Big Scale Production Necessary to Keep Pace with Progress of Paving

ERIE County, in New York State, has been going in for concrete pipe rather strongly of late. In the last year a prodigious amount of concrete sewer pipe and concrete storm-water drain has been laid in that county, covering four great boulevards, the smallest of which is more than three miles long. The four boulevards in question represent developments at the north end of the city of Buffalo, in which direction the city is growing rapidly. All the pipe and storm-water drains on these four boulevards are of concrete, and all have been laid by a single company, the Newark Concrete Pipe Company.

George G. Diehl, consulting engineer, is the man responsible for the concrete pipe work. The sewer system covered by the several contracts on the boulevards consists of more than 20 miles of sewer, varying in size from 8 in. to 48 in., and spreading over a district extending from the northern part of the town of Kenmore to the Niagara River. A pumping station and disposal plant are included in the contracts.

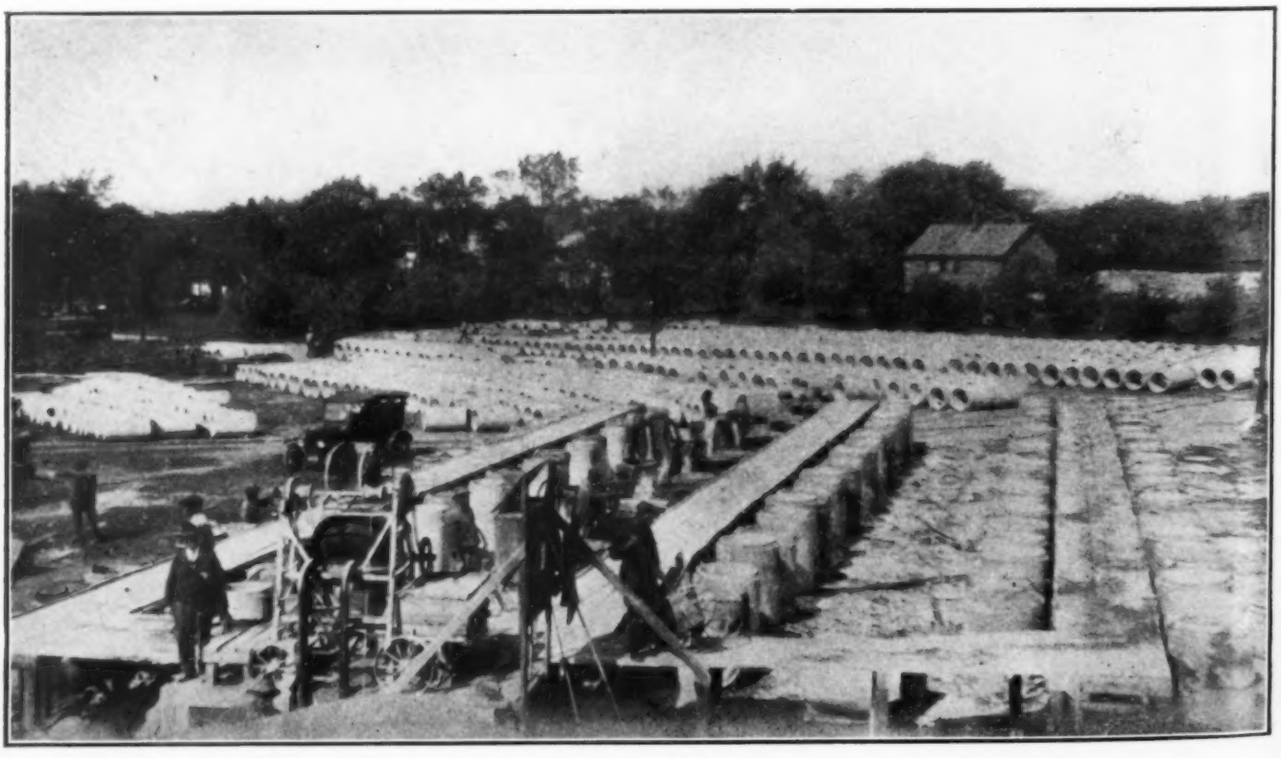
All the pipe in the job having a diameter of over 20 in. was constructed of reinforced concrete, and as the depth of the trench in some places was over 30 ft., extra heavy reinforced concrete was necessary in many cases. The pipe was made and laid under difficulties due to the almost continuous rains and the bad character of the soil in which the pipe was being laid. The ground at this point is mostly of a sticky clay composite, which becomes almost unmanageable under heavy rains. The paving contractors, moreover, were pushing the work forward faster than anybody had expected, in spite of difficulties of their own, and very rapid work was necessary to keep out of their way.

Pipe was manufactured at three points—at the Jewett Stove Works in Tonawanda, at the Buffalo Cement Company in Buffalo and at the old plant of the Curtiss Airplane Company in the same city. It was felt that greater efficiency in production would be obtained by thus dividing the points of work, as experience in concrete pipe production shows that small gangs work better than large ones.

The plants were very similar, and that at the Curtiss Airplane Company is typical of the others. It is laid out with three storage houses for materials, a large shed for pipe manufacture during cold weather, a wide storage yard for manufactured pipe, centrally located mixer and wheeling platforms extending out into the yard.

The storage sheds contain respectively 1200, 2000 and 1600 bags of concrete. Sand and gravel is stored in piles or used directly out of the railroad cars in which it is hauled, the mixer being located only about 20 ft. from the railroad siding. The mixer is of ¼-yd. capacity, experience having shown this to be the most practical size.

The wheeling platforms are raised about 4 ft. from the ground, and extend about 25 ft. into the yard, forms being set up on either side of the platforms, and the concrete delivered to them from buggies, hand-wheeled from the mixer. The wheeling platforms at the Curtiss plant are three in number, each

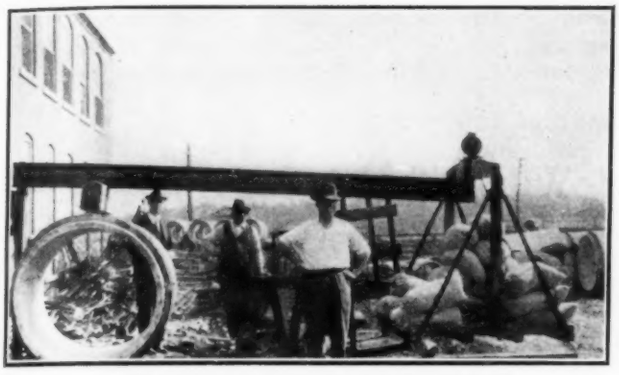


STORAGE YARD AND WHEELING PLATFORMS WITH MIXER IN FOREGROUND

serving 18 48-in. molds, or more of the smaller sizes.

Most of the smaller pipe, however, is poured and finished in the shed, which contains a long wheeling platform similar to those in use out of doors, and connected with them. The general plan of work is to pour the larger sizes out of doors during fine weather and the smaller sizes indoors when the weather forbids work on the larger pipe.

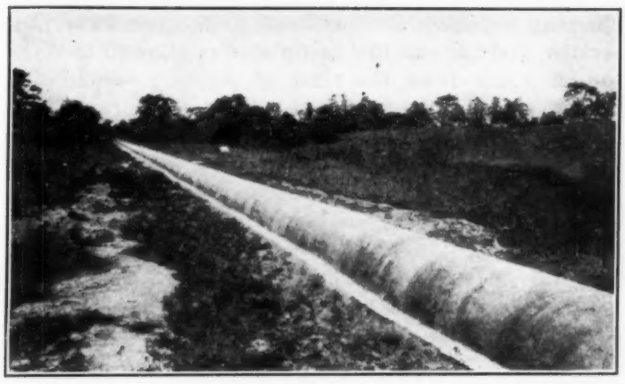
The forms consist of carefully squared steel plates curved to the shape of the inside and outside of the



KNIFE EDGE TEST OF 60-INCH PIPE

pipe sections and held to shape by strong angle-iron clamps and angle-iron rings to hold them truly circular. The inside steel forms are set upon carefully machined cast iron bases on which the bell ends of the pipe are formed, and all exposed surfaces are oiled to prevent sticking of the concrete.

The reinforcing material consists of electrically welded steel fabric, in various sizes with 2-in., 3-in., and 4-in. spacing, according to the directions of the

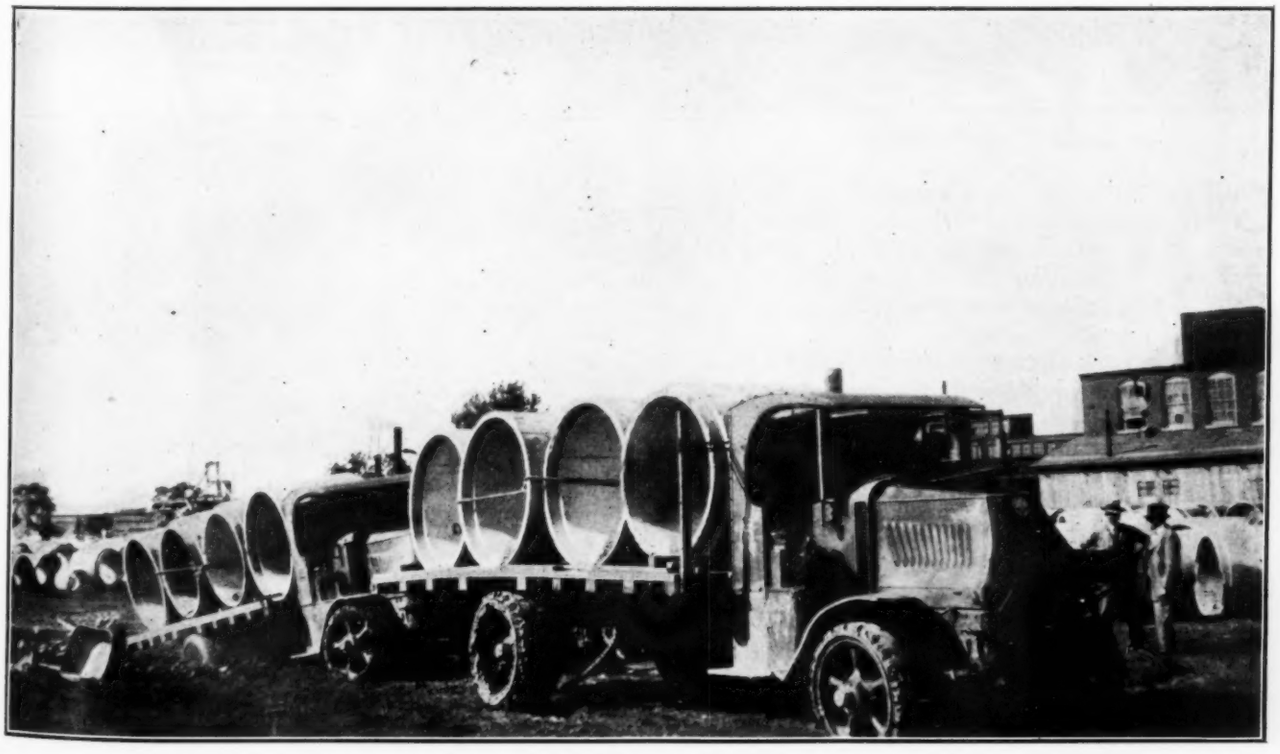


BIG PIPE IN POSITION ON CROSSTOWN BOULEVARD

engineer and the requirements of the particular job. This is first placed in position, and the outside form locked in. A tamping platform on which a man can stand is then put over the top and a small amount of mortar poured in. The object of this is to coat the tamping platform and reinforcing steel with cement so that none may be robbed from the mixture for the wall of the pipe when it is introduced.

When this is completed the concrete is poured in, a mix of 1-2-4 being used, and is agitated with slice bars until the form is filled. A cast iron ring, accurately machined to fit the base, is then placed on the top side of the outside form and filled with concrete, thus forming a spigot which fits the bell as accurately as the top ring fits the base.

After the concrete has settled and the top ring been refilled, a canvas cover is thrown over the top of the form and wet steam introduced from a 1¼-in. line from the boiler until the concrete has set sufficiently to allow of the forms being removed. They



LOADING PIPE ON MOTOR TRUCKS FOR TRANSPORTATION TO JOB

are then set upon another base to form another pipe section, and the one just completed is allowed to stand for 96 hours from the time of pouring, when it is turned on its side and rolled away to storage.

A record of as much as 600 ft. of pipe a day has been made at the Curtiss plant with a staff of 21 men. This was necessary, as at one time the pipe contractors were feeding seven trenching machines with a full equipment of trucks, tractors and horses. The problem, once the system was developed, was one of quantity production and careful supervision of the work by engineer inspectors.

All sizes of the pipe for the work were tested by the knife-edge test of the American Society for Municipal Improvements. A load of several thousand pounds per lineal foot is applied to a section of pipe resting on a steel bar one inch wide through a steel bar one inch wide on the top of the pipe. This is a very severe test, and while troublesome and expensive to make was a source of great gratification to the engineers on the job and the manufacturers of pipe, as each section met the test in a very satisfactory manner.

In the winter, and in periods of inclement weather generally, the water used in mixing is heated by steam from the boilers, and the shed is used for mixing and pouring. The concrete is hauled on 7-ton trucks, which will handle four of the 48-in. sections.

COMPRESSOR KEEPS BUSY WINTER AND SUMMER

AT WORK IN THE SHOPS

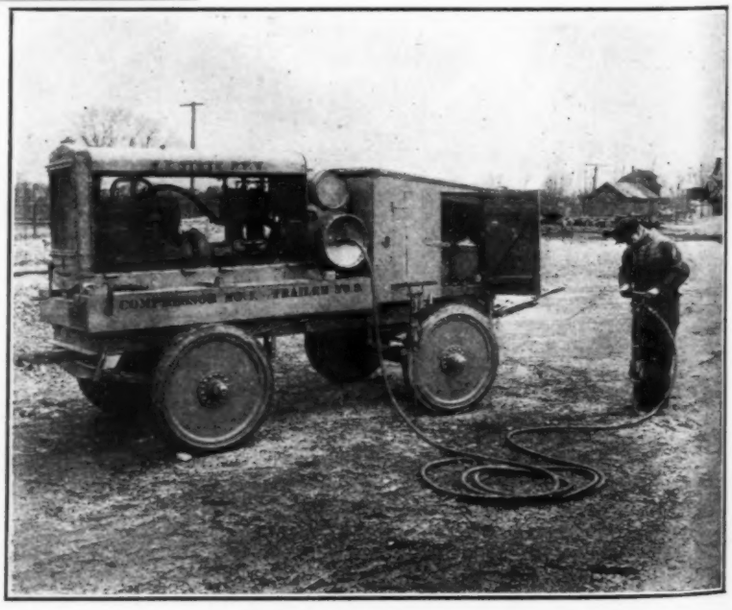
GETTING the maximum amount of work out of any piece of equipment always is a problem in the construction field. The machine that pays for itself most quickly is that which can be kept busy practically all of the time.

The New York State Highway Department has solved this problem in the case of a portable air compressor allotted to the division consisting of the four counties of Niagara, Erie, Chautauqua and Cattaraugus. The repair shops of this division are at Hamburg and the highway department has made use of the compressor during the winter months on general repair work inside the shops.

The compressor is mounted on a special trailer designed by the department, including a tool shed as part of the unit, and the whole outfit is run indoors and put to work on such jobs as drilling, reaming, and riveting of motor truck frames, and caulking, chipping and grinding after welding operations.

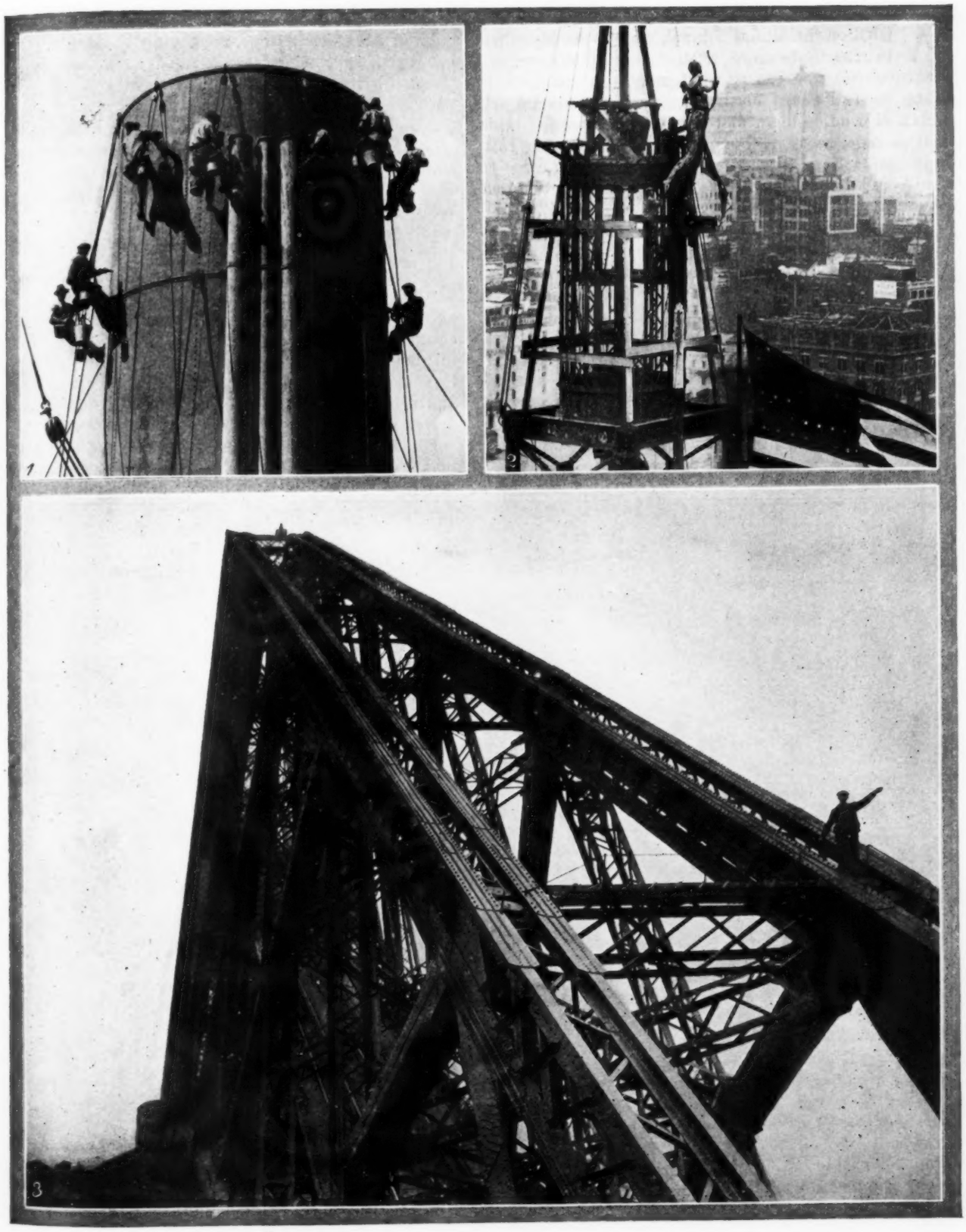
The compressor also is equipped with a wire brush with which truck bodies are prepared for painting, which is done with air. In the summer months, of course, the compressor is used outdoors for the general work of the department, and at times in the winter it is also taken out for breaking ice. The two photographs on this page show the outfit being used for repair work on a truck indoors, and for paving breaking on the highway.

The use of this compressor for double duty generally increases its value to the New York Highway Department and it eliminates some of the expense which is inevitable during the winter months.



OUT ON THE HIGHWAY

The Men Higher Up



1. Painting the smokestack of an ocean liner © *International.*
2. Lowering the famous statue of Diana from the tower of Madison Square Garden, New York © *International.*
3. Repainting the great Forth Railroad Bridge in Scotland © *P. & A.*

MODERN METHODS SPEED WORK ON MOFFAT TUNNEL

Up-to-Date Machinery Used in Drilling Six Mile Shaft Through Rockies

WORK on the Moffat Tunnel, which was described in the February, 1924, issue of SUCCESSFUL METHODS is progressing, and modern machinery is doing its full share in the big project. This tunnel, which is 6 miles long, pierces the Continental Divide in Colorado, west of Denver, and will provide railroad connection between Denver and the country to the West which hitherto has been reached with great difficulty.

In reality there are two tunnels running parallel to one another. The smallest tunnel, 8 ft. sq., is later to be used to convey water from the west side of the Rockies to the east. This pioneer bore is connected with the railroad tunnel by means of crosscuts at intervals of 1500 ft.

A special air-hoist has been devised for switching the muck cars. By means of it muck cars are picked up and switched laterally. This gets rid of delays and derailments that might often be encountered. The operating cylinder is suspended from a trolley that runs on a steel bar.

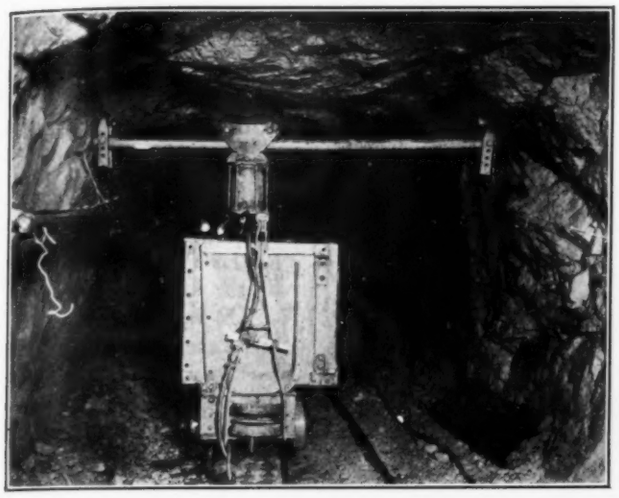
In order to save time in moving the drills at the headings, special carriages have been devised. A channel-bar frame supported on a track has a trolley with steel columns on each side that are held rigidly together by means of horizontal cross-bars. Screw jacks hold these bars against the side walls when drilling is being done. Within less than 15 min. after the time of arrival, breast drilling can be started. While the drill crew is working in one tunnel, the muckers can be at work in the other. Then they can shift places.

An apron, scoop and endless belt conveyor are features of the mucking machine. Four men are required to operate one of these machines. With this equipment they can load a car of 50 cu. ft. capacity in about 2 min. This means that something like 50 tons of material can be handled in 2 hr. The apron and scoop swivel from side to side. A 50-hp. motor drives the scoop.

Faster progress has been made from the east portal than from the west. The water tunnel and main

DRILL CARRIAGE USED IN BORING MOFFAT TUNNEL

heading are in about a mile and a half from the east portal; and are in but a little more than a mile from the west portal. This difference is due to the fact that the crews working from the western portal encountered much more difficult working conditions.

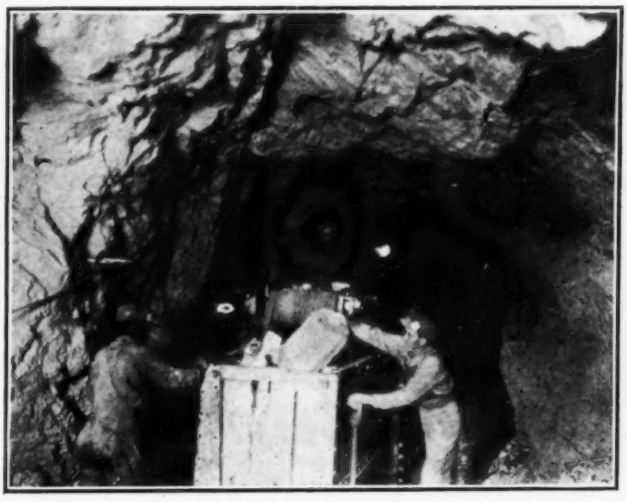


AIR HOIST SWITCHER SAVES TIME

Before the work started, geologists predicted that solid rock would be encountered at a penetration of about 1500 ft. However, their predictions have not come true. The soft rock continues even at a depth of 6000 ft. It has slowed up the work and has added to the engineering problems.

The vastness of the project can be comprehended when it is considered that the estimates place the total rock excavation at 522,500 cu. yd. To handle this great volume of material men working in 8-hr. shifts are on the job day and night. Electricity for lighting and other purposes is generated at a station on South Boulder Creek. Direct current of 250 volts is supplied for driving the mucking machines, electric locomotives, blowers, etc. The air for the compressors is delivered to the headings by means of an 8-in. line that is carried through the water tunnel. Then smaller piping conveys the compressed air through the crosscuts to the points where it is required. Fresh air is a prime essential for the workmen at this altitude. A ventilating plant has been set up at each portal capable of delivering close to 25,000 cu. ft. of free air per minute to the various headings.

Good working conditions for the men have done much to keep up their morale; good meals and good



MUCKING MACHINE LOADING CAR

wages have done their share, too. Having satisfied workmen means much in a big project of this nature where the work extends over a long period and where the success of the undertaking depends to a great degree on the loyalty of the men.

THE PICTURE ON OUR COVER

A GLIMPSE at the construction methods used in other parts of the world are always of interest. That is why this issue of SUCCESSFUL METHODS bears on its front cover a photograph of a construction job in the Far East. This photograph shows elaborate scaffolding used on a building in Canton, China. This scaffolding is made of bamboo, and as bamboo is comparatively cheap in China, plenty of it is employed. The foreground of the photograph shows that even a Chinese contractor has no conscientious objections to making things hard for the pedestrian in passing the building on which he is working.

This photograph from China is copyrighted by Ewing Galloway.

ORANGE PAINT TO MARK OHIO ROADS

THE Ohio Department of Highways, of which L. A. Boulay is Director, is trying out a new plan for marking center lines on the State roads. With his department, as has been the case in other states, white paint has been used for the center line, but Ohio now uses orange paint for the center lines on straight stretches of road. White paint will still be used for marking the centers of curves, hills and other places which are known to be dangerous, and the orange lines on the straight roads will simply serve to divide traffic.

VETERAN CONVEYORS WORK IN THREE STATES

Prove Their Worth on Road Jobs in Iowa, Wisconsin and Illinois

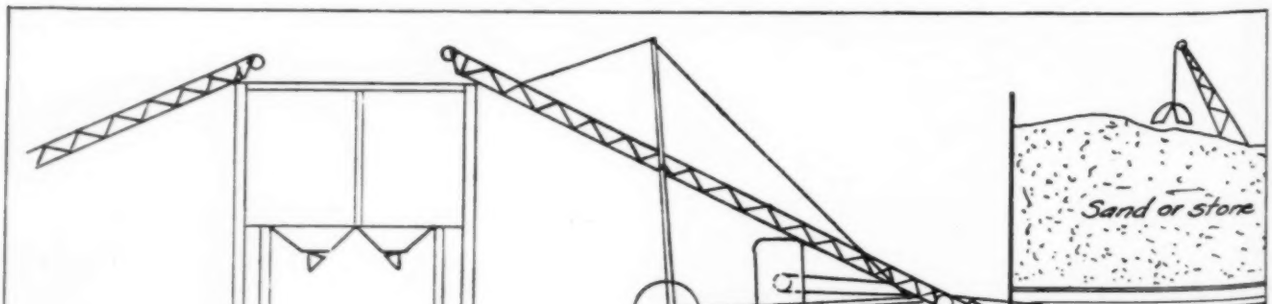
MACHINES which can keep on doing good work year after year are invaluable in the construction business. The Henkel Construction Company of Mason City, Iowa, has a couple of conveyors which were purchased in 1922 and are still performing efficient service. When these conveyors were bought the Henkel Company planned to use them as assistants to a crane in their material yard on a 5-mile road job, but when the conveyors were installed, it was found that they were capable of taking care of both the sand and gravel bins.

The following year the same conveyors were shipped to Fox Lake, Wis., and were set up and operated on a 4-mile road job. Last season the Henkel company bid in a 12½-mile job at Manchester, Ill., and not only used their old conveyors but purchased additional ones to act as feeders. These new conveyors were installed horizontally in a tunnel and the storage piles then were built over them, as shown to the right in the general view of the yard on the next page. The diagram at the bottom of this page also shows the arrangement. The horizontal conveyors carried the material from any section of the storage pile and deposited it on the inclined conveyors which were used to load the bins. This eliminated all rehandling of the stored material between the storage pile and the bin which action had been necessary before the horizontal conveyors were installed. Of course the crane was used to make the final cleanup of material which did not flow to the belts, but this was done after all the cars had been unloaded and the crane was otherwise unoccupied.

INCLINED CONVEYOR FILLING BIN

This method of loading the bins has proved its efficiency on three road jobs and the Henkel Company expects to continue it on its work this season. On the Manchester job an average of 530 sq. yd. a day was maintained, the maximum day's run being 966 ft. The road was a standard Illinois 18-ft. road built of concrete with a 1:2:3½ mix. The progress which was made on this job and also on the previous jobs was only possible because the material yard was so organized that the mixer was kept constantly supplied with aggregates. Only two men were needed to run the conveyor system. The average haul to the mixer was about 3 miles and from 12 to 22 small trucks were required to transport the aggregates.

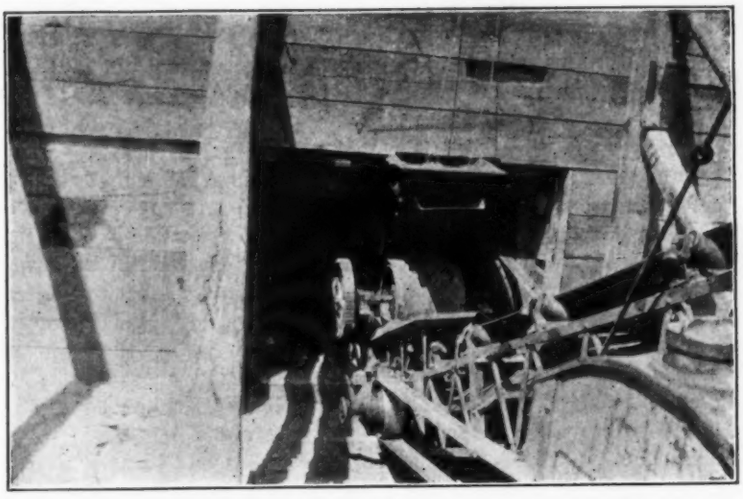
The photographs which accompany this article were taken when the conveyors were working on last season's job at Manchester, Ill. The large photograph on this page shows one of the inclined conveyors filling the bin and illustrates clearly the cross cleats with which the



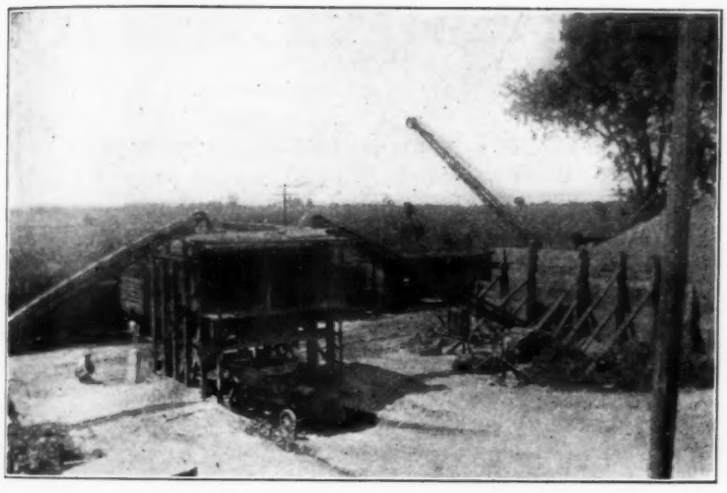
SETUP OF BIN AND CONVEYORS. HORIZONTAL CONVEYOR IN TUNNEL UNDER STORAGE PILE AT RIGHT

rubber belt was equipped in order to increase its efficiency in handling the crushed stone.

The upper photograph on this page is a close-up of the bulkhead at the point where the horizontal conveyor in the tunnel fed the material to the inclined conveyor. It may be noted that the horizontal conveyor is driven by the inclined conveyor. The photograph below shows a general view of the Manchester material yard. The two conveyors may be seen filling the bin with a small truck underneath the bin receiving aggregates which it will take to the mixer. At the right of this photograph, as said before, may be seen the storage pile with a tunnel under its center. The crane with which the material was unloaded from the cars and deposited on the storage pile may be seen in the right background.



HORIZONTAL CONVEYOR FEEDING MATERIAL TO INCLINED CONVEYOR



GENERAL VIEW OF MATERIAL YARD SHOWING BINS AND CONVEYORS

The difference between profit and loss on a concrete road job so often depends on the ability of the contractor to keep the mixer going day in and day out that the method of keeping it supplied with aggregates deserves most careful attention. The method used by Henkel Brothers on the three jobs described has stood the test of three years' time and has kept the cost of handling the aggregates at a comparatively low figure. The conveyors have done their share of the work smoothly and efficiently, and have eliminated the use of a second crane for handling the sand and stone, which would have resulted in additional expense.

MICHIGAN UNIVERSITY OFFERS SUMMER HIGHWAY COURSES

THE University of Michigan has announced its usual series of highway engineering and highway transport courses at the summer session which begins June 22 and ends August 14. A list of these courses follows. Any additional information may be obtained by writing Professor Arthur H. Blanchard, 1026 East Engineering Building, University of Michigan, Ann Arbor, Mich.

Highway Engineering (*Civil Engineering* 40). *Three hours credit. Monday, Tuesday, Wednesday, Thursday, Friday and Saturday at* 9. *Prof. R. S. Swinton.*

Fundamentals of highway engineering, including economics, financing, administration, legislation, design of highways and the construction and maintenance of the different types of roads and pavements.

Highway Engineering Theory and Economics, and Highway Transport Surveys (*Civil Engineering* 41). *Two hours credit. Tuesday, Wednesday, Thursday and Friday at* 8. *Prof. A. H. Blanchard.*

Theory of design and economics of highway improvements including road and street systems, the individual highway, locations, drainage systems, grades, curves, cross-sections, widths, intersections, selection of type of wearing course, highway factors affecting economic highway transport, and traffic engineering problems. Highway transport surveys including office and field methods of estimating the amount and character of future traffic.

Highway Engineering Design (*Civil Engineering* 43). *Three hours credit. Tuesday, Wednesday, Thursday and Friday from* 1 *to* 5.30. *Prof. R. S. Swinton.*

Field work and problems relative to the design of roads and streets, drainage systems, curves, grades, cross-sections, intersections and earthwork. Field methods of reconnaissance and surveying. Office methods used in mapping and estimating. C. E. 43 must be preceded or accompanied by C. E. 41.

Highway Transport Economics, Methods, Legislation and Management (*Civil Engineering* 44). *Two hours credit. Tuesday, Wednesday, Thursday and Friday at* 11. *Prof. A. H. Blanchard.*

Economic comparison of methods of transportation; utilization of highway transport by steam and electric railways; municipal haulage; municipal delivery systems; intercity and rural haulage; intercity and rural motor express; motor bus transportation; horse transport methods; terminal clearing houses; highway transport management; cost of operation of motor vehicles; cost and record systems; legislation pertaining to motor trucks, tractors, trailers and motor busses; fees and taxes; and private and common carriers.

Highway Engineering and Highway Transport Research (*Civil Engineering* 66). *Credit and hours to be arranged. Prof. A. H. Blanchard.*

Assigned to work on approved research problems. Open only to students having the written approval of the Professor of Highway Engineering and Highway Transport.

Civil Engineering 40, 41, 43, 44 *and* 66 *may be taken for credit in the Graduate School or in the College of Engineering of the University.*

BUILDING THE DIX RIVER DAM

Top of Rock-fill Structure Is 275 Ft. Above Bottom of Gorge

THE newly completed Dix River Dam in Kentucky, 20 miles southwest of Lexington, is remarkable for several reasons. It is said to be the highest and largest rock-fill dam in the world. Its crest rises to a height of 275 ft. above the bottom of the gorge. In its construction a total of nearly 2,000,000 yd. of blasted rock was required.

To divert the waters of the Dix River while the dam was being built, a tunnel nearly 1000 ft. long was driven through the rocky cliff. A special flood channel has been provided to carry off flood waters and prevent any overflow of the dam.

The great job confronting the contractors was to handle tremendous quantities of materials under extremely difficult conditions. One of the first jobs was to build a spur to connect the site with the railway two miles distant. A well-equipped camp for 1000 workmen had to be provided. Tons of earth and clay had to be stripped off the bedrock.

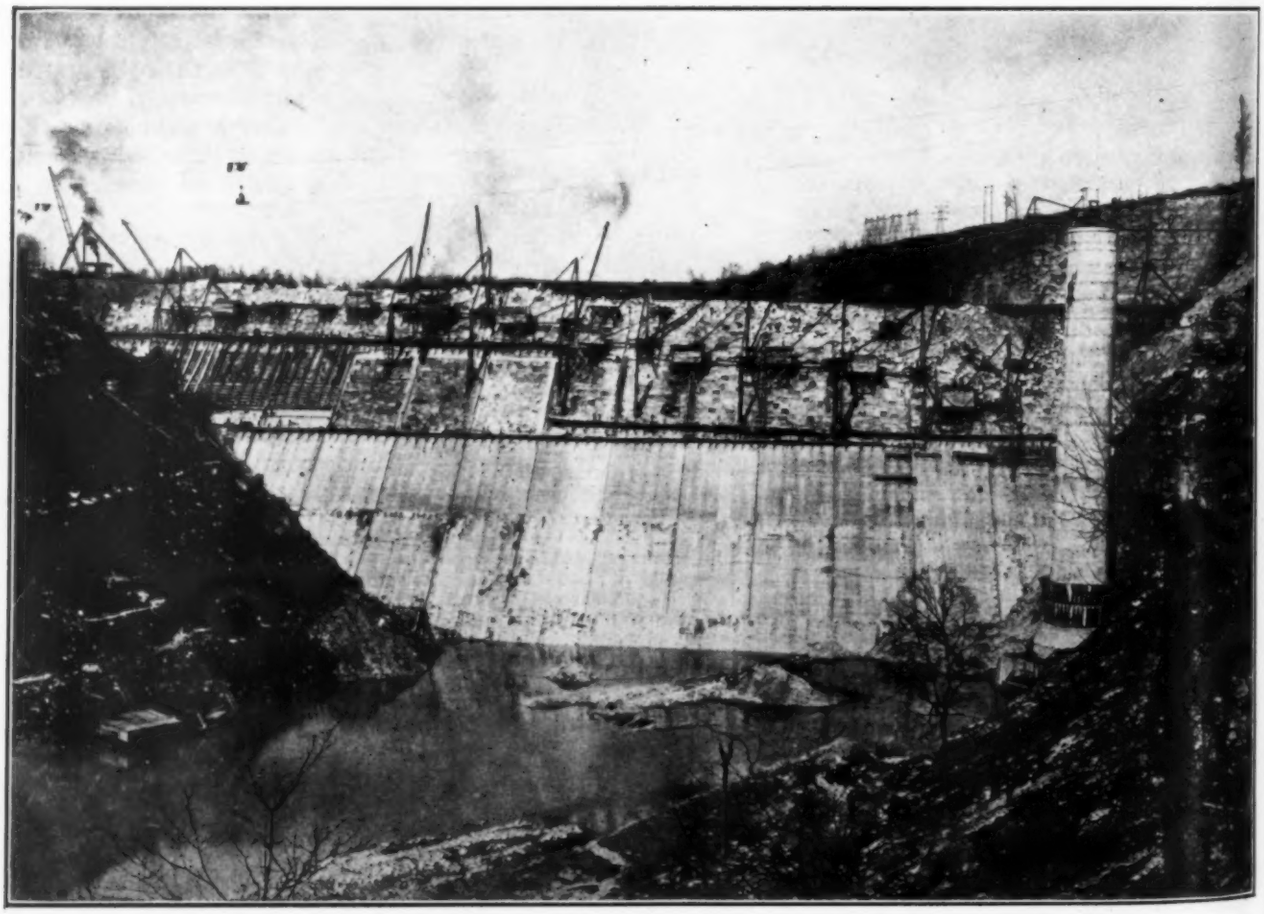
Rock from the spillway channel was depended on largely for building the dam. Locomotives hauled 5-car trains of this rock to the dam, a switchback arrangement being used. A block system, operated from a central tower, controlled the movement of these trains. More than 20,000 trains were successfully handled.

Two large blasts opened an additional quarry for rock supply. One shot, in which 82,000 lb. of powder was used, brought down nearly 100,000 cu. yd. of rock.

On the loose rock fill, derricks laid a wall that varies in thickness from 21 ft. at the bottom to 7 ft. at top. Selected rocks, some of them weighing several tons each, were used for this section. Skilled masons were employed, as it was highly important to lay the face rocks true to line and to fill all crevices. Three-foot depressed grooves were provided and were filled with concrete to form the ribs under the expansion joints.

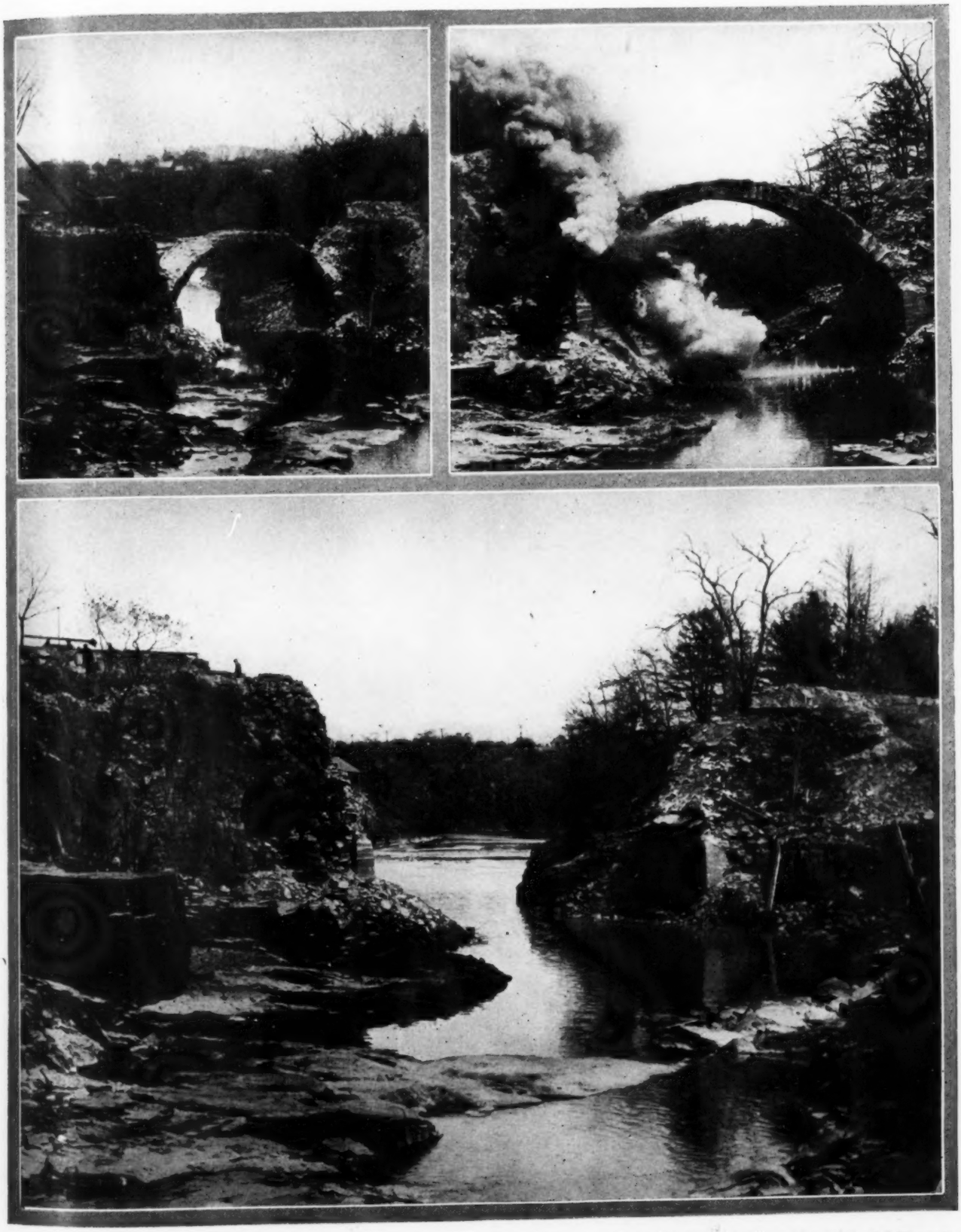
Another big task was the laying of the concrete apron. Aerial cableways were used to convey the concrete from the mixing plant to the hoppers on the face of the dam. The apron varies in thickness from 8 in. at the crest to 18 in. at the cutoff trench. Wooden forms were bolted to channel irons, and these were wired to the reinforcing mat; this in turn was wired to anchors in the derrick-laid wall.

Work was carried on continuously day and night for more than a year in a determined effort to put the big job through on schedule time. The L. E. Meyers Company, Chicago, was the general contractor on the power development. The Kentucky Hydro-Electric Company built the transmission lines.



AT WORK ON FACE OF DIX RIVER DAM

The Passing of a Veteran

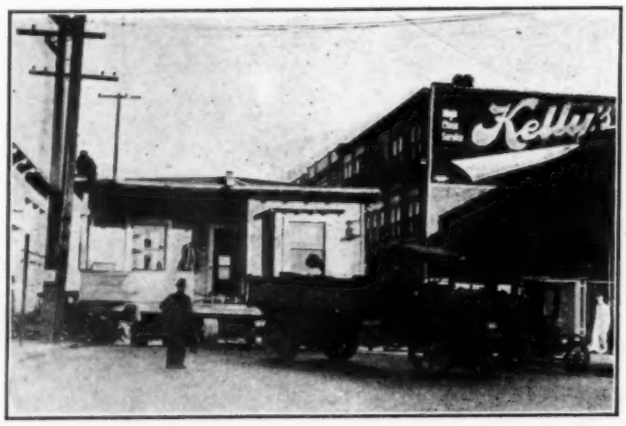


These three photographs were taken during the demolition of the masonry bridge which carried a canal over the Passaic River at Little Falls, N. J. This bridge was built in 1826

THE UP-TO-DATE WEST

On the Pacific Coast Houses Are Moved by Modern Methods

SOME photographs of house moving operations in Chicago and Brooklyn which appeared in the March issue of SUCCESSFUL METHODS are responsible for this article. Horses were the motive power used in these operations, and the captions describing the photographs commented on the fact that horses had not been displaced by automobiles in that work.



JUST ROOM TO GET BY

A San Francisco reader of SUCCESSFUL METHODS, S. L. Foster, chief electrician of the Market Street Railway, lost no time in writing and pointing out that whatever archaic methods may be in use in Chicago and Brooklyn, when a house has to be moved in San Francisco, automobile trucks are called upon. To prove his statement, Mr. Foster sent the photographs which are shown herewith and they seem to establish beyond the shadow of a doubt that motor trucks are used to move houses on the Pacific Coast. Mr. Foster describes the method used as follows:

"In San Francisco horses are *not* used in house moving and have not been used for several years. You may be right about Chicago and Brooklyn.

"One-story houses are mounted on three 4-wheel trucks or bogies, one ahead and two behind, and are drawn by one or two ordinary large-weighted motor

SAN FRANCISCO HOUSE MOVERS WORK AT NIGHT

trucks. The wheels on the three trucks or bogies under the building are solid or spoked, steel wheels about 24 in. in diameter with steel tires 12 in. wide.

READY TO MOVE A THREE-STORY HOUSE

These houses are moved at the rate of about three miles per hour on the pavement.

"Larger houses of wood or brick are moved on rollers but, instead of horse-power capstan, the houses are pulled through the usual multiplying rope tackles by one or two heavy, special autotrucks equipped with vertical winches or capstans driven by the automobile engine.

THE HOUSE ON ITS WAY DOWN THE STREET

"A 12-in. by 12-in. timber is dropped through a convenient sewer manhole as anchorage for the motor

TWO TRUCKS ROLLED THIS STRUCTURE ALONG

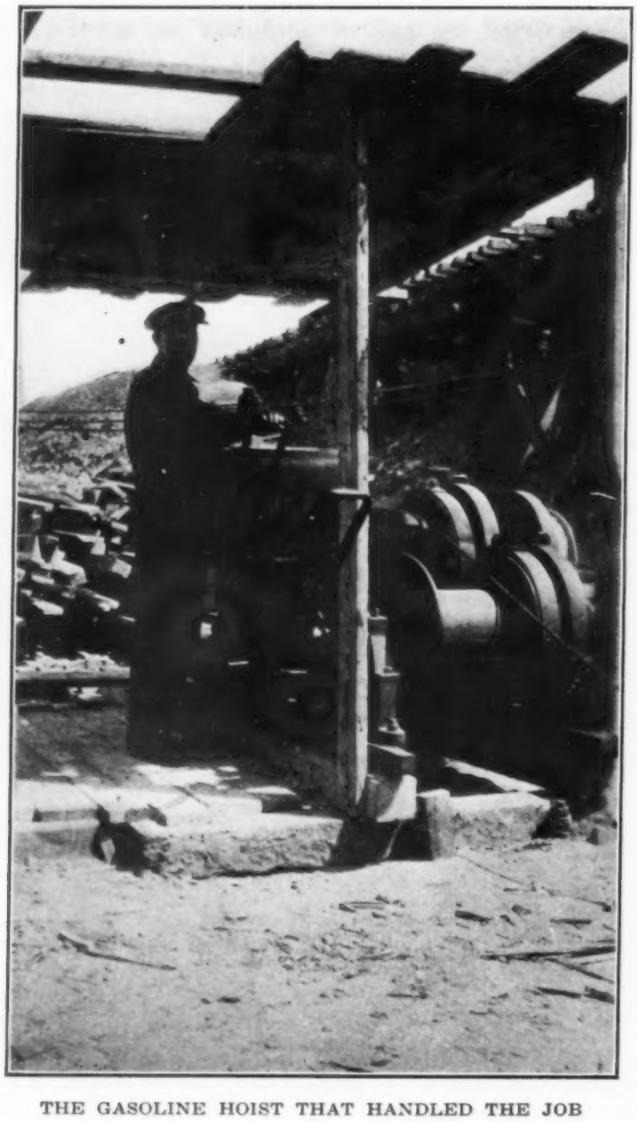
truck, and the great house moves along rapidly and uninterruptedly as fast as the force of men can shift the way planks and rollers ahead. Occasionally of a cool night when the bituminous paving is hardest, the way planks are eliminated and the lignum vitae rollers roll along the pavement, thus expediting the job very materially."

Several of these photographs were taken by W. H. Farlow, chief draughtsman of the Market Street Railway Company.

SMALL HOIST PUTS UP BIG STACKS

Gasoline Outfit Handles Heavy Steel Without Difficulty on Power Station at Fort Miami, Ohio

A SMALL gasoline hoist is doing the hard work in the erection of two steel smoke stacks on the new power building which is being constructed by the Foundation Company for the Columbia Power Company at Fort Miami, Ohio. The roof of the building is 100 ft. above the ground level, the tops of the stacks being 95 ft. above the roof of the building. The hoist itself is mounted on the ground level and is operated by the Kittoe Boiler & Tank Co., of Canton, Ohio. This company has handled all of the hoist work in connection with the stacks and when the job is over will have hoisted about 80 tons of steel from the ground level to the roof and from the roof to the stack.



THE GASOLINE HOIST THAT HANDLED THE JOB

HOISTING STEEL INTO PLACE

The use of gasoline operated equipment for jobs of this sort is constantly increasing and this 15 hp. hoist which can be moved with little difficulty and supplied with fuel even when put in an almost inaccessible position, is doing all the work which a steam hoist could accomplish.

USING A FINISHER ON WIDENED CURVES

THE best way of using a mechanical concrete road finishing machine on widened curves is well illustrated by the accompanying photograph. which was taken on a typical job.

A false form is set around the curve for the width of the machine, and this width is spread, tamped and surfaced mechanically. The widened portion of the curve is finished by hand. Concrete for this widened portion is, of course, placed by the mixer as the machine moves ahead, but the finishing is postponed until after the machine has done its work.

This false form is usually made of wood, although in some cases light steel channels have been used. These forms, of course, are pulled after the machine has finished its work. This method of taking care of widening curves has proved its value on a great many jobs, and has practically been adopted as standard on that particular kind of work.

PORTABLE SAW RIG EFFECTS BIG SAVINGS

THE utilization of portable machinery on concrete work has been brought down to a science by the Gordon Mortgage Company of Portland, Ore., which builds and sells small houses. In order to speed up the cutting of the wood used in the houses, a portable saw rig was constructed which could be mounted on a two-wheel trailer and hauled by a motor truck. This saw rig performs the triple operation of cutting

the forms, the timbers for the frame and the lighter wood for the finish. Every stage of the work is scheduled ahead and a certain number of hours is allowed for each part. All of the cutting is done on the job and as soon as one cutting is finished, the saw is moved on to the next job.

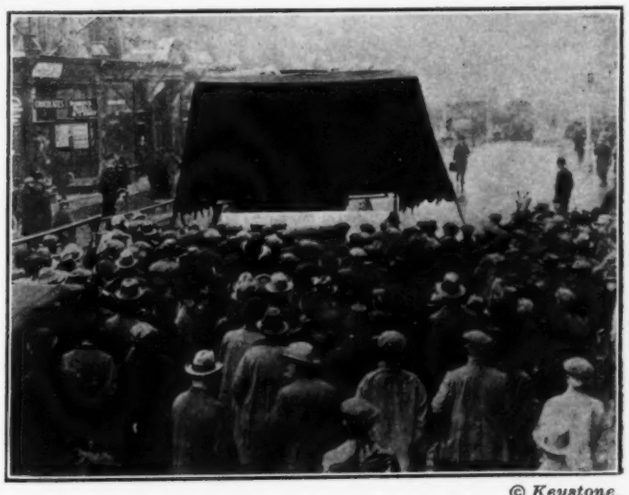
The machine has enabled the company to make great savings in lumber as it is possible to buy culls, cut out the poor parts, use the good pieces for the houses, and put the poor material into cheap shacks which are sold at cost. The use of patterns enables the operator of the machine to cut several pieces of like shape at one time, and this is done to as great an extent as possible. The machine is easily loaded and set up by the cutter and helper who move on with it from one job to another.

MOVIES SHOW WHO DOES THE HARD WORK

AN unusual plan for persuading workmen to take great interest in their work was tried out recently in London during the paving of Victoria Street. A photograph of this street during the paving operations is shown on page 2 of this issue of SUCCESSFUL METHODS.

The contractor who was doing the job took a number of moving pictures of the progress of the work, and in looking them over found that they showed very clearly which men were working and which were taking things easy. As a result of this discovery, the idea was conceived of showing the films right on the street where the work was going on. This was done in the specially constructed tent shown in the accompanying photograph.

All of the workmen were invited and by their comments it soon became evident that they had made the



© *Keystone.*

same discovery that their employer had made when he first looked over the films. The men who were loafing found themselves targets for some rather pungent expressions from the other men. The contractor felt that his unusual plan more than paid for itself by the increased activity of the men.